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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/696,232

10/26/2000

Mitsuru Ishikawa

07553.0017

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02/17/2009

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EXAMINER

OLSEN, ALLAN W

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

02/17/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/696,232	ISHIKAWA ET AL.	
	Examiner	Art Unit	
	Allan Olsen	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 November 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>11/20/08</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments filed November 20, 2008 have been fully considered but are not persuasive.

Citing an example from their specification applicant argues that the volume percentage (vol% (density)) of N₂ is essentially 22 vol% (or 100/450) which, applicant argues, is approximately four times greater than that disclosed in Halman. In response to applicant's argument that the references fail to show a volume percent of nitrogen that is comparable to that used in applicant's invention, it is noted that the feature upon which applicant relies (i.e., vol. % of N₂) is not recited in the rejected claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The calculation of volume percent necessarily includes the amount of Ar that is used in the gas mixture but argon is not included in the claims. As noted in the interview summary, if the relative amount of Ar is critical to the claimed invention then this must be included in the claims. Currently, claim 1 only requires a particular ratio between N₂ and CF₄ and as noted by applicant, "Halman discloses that the flow rate of nitrogen can be as low as 2 sccm, and the flow rate of the fluoride-containing gas can be 10 to 100, preferably 40 to 60 sccm. 'Although there is no upper limit on the amount of nitrogen which can be added to the gas ...'"

With respect to Li, applicant argues Li fails to explicitly teach or suggest a flow rate ratio of CF₄ and N₂ in a processing gas is set within a following range: (N₂ flow rate

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/ CF₄ flow rate) ≥ 1 to prevent an occurrence of an etching stop and (N₂ flow rate / CF₄ flow rate) ≤ 4 to prevent an occurrence of bowing. Furthermore, Li fails to teach or suggest wherein a processing gas has a selection ratio greater than approximately 2.0, Applicant also argues that Li

In response, the examiner again cites the following teachings in conjunction. Halman teaches combining CF₄ and N₂ and Halman teaches that "there is no limit upper limit to the amount of N₂ that can be added. Li teaches adding N₂ to control the etching profile (Li explicitly teaches adding N₂ to prevent bowing as claimed by applicant).

Applicant also argues, that the Examiner alleges that "Li teaches that adding N₂ to a fluorocarbon based plasma etching of a Si-containing organic layer allows one to control the etching profile, for example, to prevent bowing..." Such teaching, even if present in Li, which Applicants do not necessarily concede, however, fails to teach or suggest wherein a flow rate ratio of CF₄ and N₂ in a processing gas is set within a following range: (N₂ flow rate / CF₄ flow rate) ≥ 1 to prevent an occurrence of an etching stop and (N₂ flow rate / CF₄ flow rate) ≤ 4 .

In response the examiner cites column 10, lines 21-65 for Li's teaching to prevent bowing. With respect to the argument that this does not teach the claimed ratio between N₂ and CF₄, the examiner notes that it is well within the level of ordinary skill to optimize the flow rates of the gases such that the prevention of bowing is realized while also optimizing the selectivity and this amount of nitrogen is expected to be the same as that used/required by applicant in order to achieve the claimed results.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5,658,425 issued to Halman et al. (hereinafter, Halman) in view of US Patent 6,284,149 issued to Li et al. (hereinafter, Li).

Halman teaches a method of etching a polysiloxane (TEOS 5, 8) formed on a protective layer (TiSi_x, 4, 7). Halman teaches using plasma comprising CF₄, Ar and N₂ to etch the Si containing organic film (column 4, lines 38-42). Halman teaches etching the Si-containing organic film until the protective film is exposed. Halman teaches the etching process ceases once the protective film is exposed (column 3, lines 28-30). Halman teaches a resist layer (9) is used as a mask on Si-containing organic film (column 4, line 23).

Halman does not teach using between 1 and 4 times as much N₂ as CF₄.

Li teaches adding a substantial amount of N₂ to a fluorocarbon based plasma etching of Si-containing organic layer (column 10, line 21).

It would have been obvious to one skilled in the art to use an amount of N₂ that was between 1 and 4 times as much as the amount of CF₄ because, although Halman provides examples with a 5:8 N₂ to CF₄ ratio (column 4, lines 41-42), Halman teaches that an unlimited amount of N₂ may be used (column 4, lines 50-54) and Li teaches that

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adding N₂ to a fluorocarbon based plasma etching of a Si-containing organic layer allows one to control the etching profile, for example, to prevent bowing (column 10, lines 21-65).

Halman does not teach the dielectric constant of the TEOS layer but TEOS is known to have a dielectric constant of about 3.0 (US 5,776,828)

Halman and Li do not teach an etching selectivity ratio of 2 with respect to the resist; however, as Halman and Li make obvious the claimed process it is expected the skilled artisan would achieve the same results.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 571-272-1441. The examiner can normally be reached on M, W and F: 1-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Allan Olsen/
Primary Examiner, Art Unit 1792